

IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF NEW YORK

PRINCETON DIGITAL IMAGE  
CORPORATION,

Plaintiff,  
v.

HEWLETT-PACKARD, *et al.*,

Defendants.

Civil Action No. 1:12-cv-779 (RJS)

**SEPTEMBER 16, 2013 DECLARATION OF DR. TOURADJ EBRAHIMI  
REGARDING U.S. PATENT NOS. 4,813,056 AND 4,860,103**

## **I. INTRODUCTION**

1. I submitted a declaration dated August 19, 2013 in this case on issues relating to U.S. Patent Nos. 4,860,103 (the “’103 Patent”) and 4,813,056 (the “’056 Patent”). (My August 19 Declaration). I incorporate by reference the paragraphs in the Introduction, Qualifications, and Legal Basis of Opinion sections of My August 19 Declaration, as the relevant facts recited in those paragraphs have not changed.

## **II. MATERIALS RELIED UPON**

2. In addition to the materials discussed in My August 19 Declaration, I have reviewed the opening claim construction brief of PDIC and the attachments thereto, including the declarations of Dr. Rhyne and Mr. McAlexander.

## **III. THE ’056 PATENT**

3. I have been asked to opine on the statements in PDIC’s opening claim construction brief that information can be “stored or transmitted more efficiently” using the coding scheme in the ’056 patent. PDIC expressly makes this claim at page 21 of its brief and implicitly makes this claim in the extended introduction of its brief. Mr. McAlexander does not make any such claim in his declaration.

4. For the assumptions underlying the signal being encoded in the Fedele coding scheme, the Huffman coding scheme is a more optimal coding scheme from the perspective of storage and transmission efficiency.

5. The superiority of the Huffman coding scheme is acknowledged in the ’056 patent at column 1, lines 55 to 56. The ’056 patent estimates that the Fedele coding scheme is up to 2-4 percent less efficient at column 14, lines 19-36.

6. The Fedele coding scheme is less efficient than the Huffman coding scheme because of the second set of codewords is not constructed according to Huffman coding

approach, despite the fact that some of the codewords with lesser probabilities can become shorter in their lengths. This is because the codewords with greater probabilities can become longer in their lengths. This is explained in the patent at column 14, lines 24 to 30.

7. The advantage of the Fedele coding scheme is that by defining and coding a number of conditions, Huffman coding of extremely rare codewords with larger lengths (for instance greater than 16-bits), can be avoided. Fedele noted that large codewords of that length were created because of the number of conditions being encoded (including 32 non-zero conditions and 240 zero run length conditions).

8. Alternatives to the Fedele coding scheme that also avoid extremely rare and large Huffman codewords include encoding fewer conditions.

9. In the preferred embodiment codewords are used for up to and including zero run lengths of 240. For zero run lengths greater than 240, the preferred embodiment breaks the zero run length into multiple codewords based on the horizontal drive signal. This is explained in the patent at column 13, lines 23 to 43. Thus, for zero run lengths greater than 240, the codeword of a zero run length of 240 is used with additional codewords for the remainder of the run. The patent also explains at column 11, lines 3 to 17 that a marker may be inserted into the coded signal for some horizontal lines.

10. Instead of coding up to zero run lengths of 240, one could instead encode only up to, for example, zero run lengths of 35. In this example, for zero run lengths greater than 35, the codeword for a zero run length of 35 is used with additional codewords for the remainder of the run. Thus, only shorter Huffman codewords could be used to encode the signal, without a need for extremely rare Huffman codewords of larger lengths.

#### IV. CONCLUSION

11. I reserve the right to modify and supplement this declaration in response to any submissions by PDIC, including any expert written or oral submissions, and in response to any other fact or expert discovery that is conducted by the parties.

12. I declare under penalty of perjury under the laws of the United States of America and the State of New York that the foregoing is true and correct.

Date: September 16, 2013

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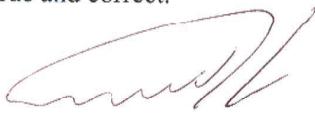
Prof. Touradj Ebrahimi

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